

## THE CHROMOSOMES OF SOME DRAGONFLIES FROM THE LANGTANG VALLEY, CENTRAL NEPAL

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The male germ cell complements are described of *Drepanosticta* sp. (*Platystictidae*), *Indolestes cyanea* (Sel.) (*Lestidae*), *Anisopleura comes* Sel. (*Euphaeidae*), *Neallogaster* sp. aff. *hermionae* (Fraser) (*Cordulegasteridae*), and *Orthetrum japonicum internum* McLachl. (*Libellulidae*). In all of these the chromosome number is  $n \delta = 13$ , while a pair of *m*-elements is lacking in *Drepanosticta* sp. and in *Neallogaster*. Save for *O. j. internum* none of the species has been previously studied cytologically. *I. cyanea* is characterized by an extremely large autosome pair (bivalent). The karyotype of *A. comes* is similar to that of *Bayadera indica* (Sel.), but differs considerably from the complement of the more "primitive" member of the family, *Epallage fatime* (Charp.). *Neallogaster* sp. is the first cordulegasteride species lacking definitely the *m*-chromosomes. The latter and *Drepanosticta* sp. are new to the Nepalese fauna.

### INTRODUCTION

The Langtang Khola arises not far over the Tibetan border on the shoulder of the Sisha Pangma and flows West under the slopes of Langtang Lirung (7245 m) into the Bhote Kosi, coming from far inside Tibet. The floor of the upper valley, beyond Ghora Tabela, lies at elevations between 3200 and 4500 m. It is one of the most frequently visited valleys of the Nepalese central Himalaya.

Lying only a 10-days' trek north of Kathmandu, the Langtang Valley was one of the first regions in the Nepal Himalaya to be geographically explored in the

early days of Nepalese mountaineering. As early as 1949 it was visited by H.W. Tilman, accompanied by the botanist O. Polunin and the geologist J.S. Scott. As sirdar and cook of the party served Tenzing Norgay of the later Everest fame, at that time already one of the most experienced Sherpas. To his vivid account of the expedition TILMAN (1952) appended an essay on the natural history of the valley by the hand of POLUNIN (1952). This, and POLUNIN's earlier paper (1950) became the basis for all forthcoming biological, and particularly ecological work in the area.

At present, the valley is classified under the Nepal Government's Remote Areas Development Program as a National Park (surface 1224 km<sup>2</sup>) (cf. MISHRA, 1974), and for this reason now receiving considerable attention from foreign biologists. Although Tilman already collected some insect material in the region, so far no systematical collecting has been carried out and the only few records on the odonate fauna of this vast area are those published by ASAHINA (1974).

During the 1976 mission (April-May) of the Netherlands Centre for Alpine Biological Research and the Department of Animal Cytogenetics and Cytotaxonomy of the University of Utrecht, among other projects, a systematic survey has been made of the odonate fauna of the region as demarcated by the line Trisuli Bazar - Ramche - Dhunche - Syabru - Ghora Tabela - Kyangjin Gompa - Gosaikund. A part of the material has been worked out cytologically and is subject of the present report.

The orthography of the locality names is that of the trekking map "Gosaikund - Helambu - Langtang", published by "Mandala Maps", Kathmandu (1974). The elevations stated were measured on the spot, with a Thommen altimeter and correspond to the altitudes of the actual spots of collection and not necessarily to those of the nearby villages, the names of which are given for the sake of convenience.

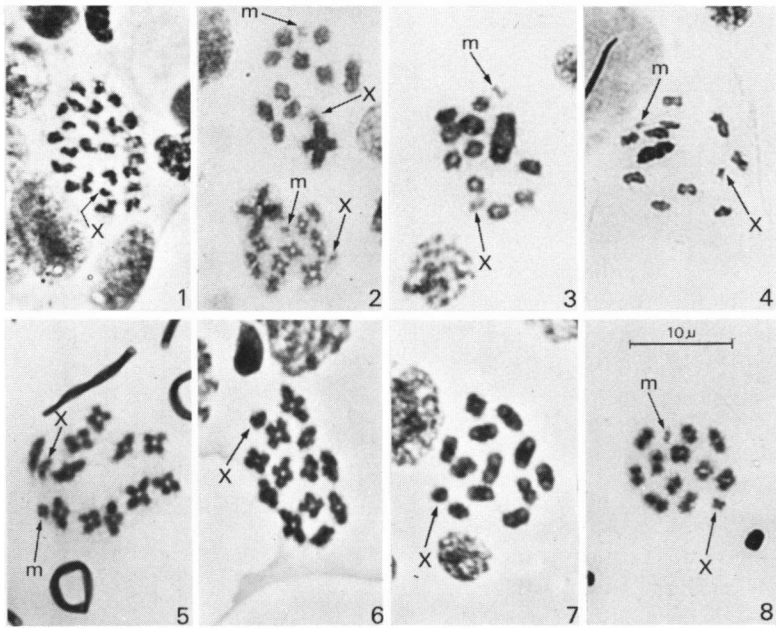
## MATERIAL AND METHODS

Only imaginal males were used for the chromosome preparations. They are referable to the following taxa: Zygotera: *Drepanosticta* sp. (*Platystictidae*), *Indolestes cyanea* (Selys) (*Lestidae*), *Anisopleura comes* Selys (*Euphaeidae*), — Anisoptera: *Neallogaster* sp. aff. *hermionae* (Fraser) (*Cordulegasteridae*), and *Orthetrum japonicum internum* McLachlan (*Libellulidae*).

Of these, only the last named had been previously studied cytologically (KIAUTA, 1975). *Drepanosticta* sp. (not *D. carmichaeli* [Laidlaw, 1915], recorded from Nepal earlier by ST. QUENTIN, 1970) and *Neallogaster* sp. aff. *hermionae* are new to the Nepalese fauna.

The slides were fixed in the field in acetic carmine, temporarily sealed off, and transported in this stage to Kathmandu, where they were further processed

(Feulgen) in the field laboratory set up in the premises of the Nepal Research Center. They were photographed in Utrecht, and are stored, along with the specimens, in the collections of the Netherlands Centre for Alpine Biological Research.



Figs. 1-8. Male germ cell chromosomes of five dragonfly species from the Langtang Valley, central Nepal Himalaya (Feulgen squash, 1500 X): (1) *Drepanosticta* sp., spermatogonial metaphase (Manigaon, 1340 m); – (2-4) *Indolestes cyanea* (Selys) (note the extremely large autosomal bivalent/dyad): (2) late diakinesis / early metaphase I (note the delayed chiasma terminalisation and chromosome contraction of the large bivalent (Langtang Khola, 1900 m), (3) metaphase I (Langtang Khola, 1900 m), (4) metaphase II (Langtang Village, 3430 m); – (5) *Anisopleura comes* Selys, late diakinesis (Ramche, 1530 m); – (6-7) *Neallogaster* sp. aff. *hermionae* (Fraser), late diakinesis and metaphase I respectively (Langtang Khola, 2150 m); – (8) *Orthetrum japonicum internum* McLachlan, early metaphase I (Syabru, 2000 m).

## DESCRIPTIONS AND DISCUSSIONS OF THE KARYOTYPES

### *DREPANOSTICTA* SP.

Figures 1, 9

**Material.** – 1 teneral ♂: Manigaon, a village on the eastern slopes above the Trisuli Khola, 1230 m; 10-5-1976. On a small stream, with cascades and waterfalls, containing but little water during the dry premonsoon season, a part of it in stagnant pools here and there in the bed (Fig. 9).

**Karyotype.** —  $2n \delta = 25$ . The single specimens yielded but a few mitotic metaphases. There is a clearly recognizable pair of autosomes that are slightly thinner and longer than the rest, the others are of gradually decreasing magnitude. There is no *m*-pair and the X is the smallest of the set (Fig. 1).

**Discussion.** — FRASER (1957) divided the *Platystictidae* into two subfamilies, viz. the New World *Palaemnematinae*, containing a single genus *Palaemnema* Selys, and the Old World *Platystictinae*. The chromosome number,  $n \delta = 13$ , of *Palaemnema paulina* (Drury) from Costa Rica has been reported by CUMMING (1964), hence this is the second member of the family and the first platystictine species examined cytologically. Contrary to the situation in our *Drepanosticta*, the karyotype of *P. paulina* does possess a pair of *m*-chromosomes. The occurrence of the *m*-elements in dragonfly complements, however, generally does not reflect any taxonomic affinities, hence it is very unlikely that it will turn out as a distinctive character on the subfamily level when more material will have been examined cytologically.

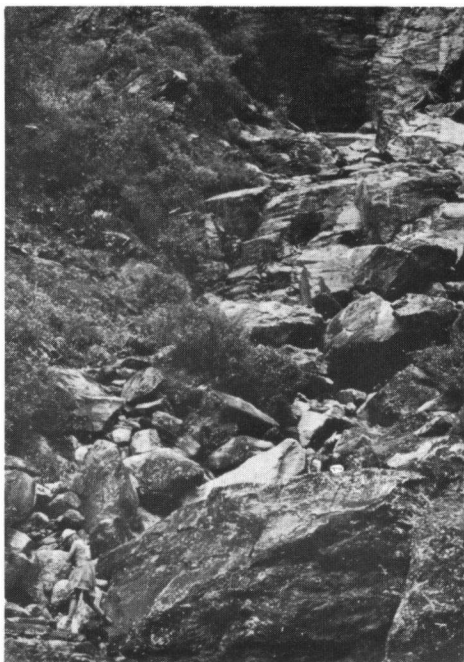


Fig. 9. The rocky bed of a cascading stream under the village of Manigaon (1340 m) in the Trisuli Khola Valley. Breeding site of *Drepanosticta* sp. (late April).

#### *INDOLESTES CYANEA* (SELYS, 1862)

Figures 2-4, 10

**Material.** — 1  $\delta$ , Langtang Khola, 1900 m, 29-4-1976; — 2  $\delta$ , Langtang Village, 3430 m, 1-5-1976 and 3-5-1976 respectively; — 1  $\delta$ , Ghora Tabela, 2685 m, 4-5-1976. While in the Langtang Khola and at Ghora Tabela they were found near small swift mountain streams in the forest, those from the village of Langtang were flying around a muddy, nearly dried out pool at the edge of a marshy, treeless area on the upper (northern) outskirts of the settlement (Fig. 10).

**Karyotype.** —  $2n \sigma = 25$ ,  $n \sigma = 13$ . The complement is characterized by an exceedingly large autosomal pair (bivalent). A minute *m*-bivalent at primary spermatocyte metaphase is still slightly larger than the X. Among the other autosomes, one pair (bivalent) is slightly but distinctly larger than the others, several of which are nearly uniform in size (Figs. 2-3). In none of the nearly 270 available figures of diakinesis and early metaphase I is there more than a single chiasma per bivalent, hence the primary nature of the large autosomes is evident.

**Discussion.** — This is the second sympecmatine species examined cytologically. As stressed earlier (KIAUTA & KIAUTA-BRINK, 1975), the frequent occurrence of an extra large autosome pair represents a characteristic feature of the chromosome cytology of *Lestidae*: it is found in both sub-families alike. In *I. cyanea*, like in *Sympecma annulata braueri* (Yakobson & Bianki) its relative size is considerable, though in the former still much larger than in the latter. The karyotypic morphology of *I. cyanea* is thus confirming our earlier expressed opinion that, as far as the chromosome cytology is concerned, the *Lestidae* are a well characterized and homogenous family, in which no subfamilies can be discerned on the basis of karyotypic features.



Fig. 10. Langtang Valley with the village of Langtang (3430 m) and its walled potato fields. In the foreground marshy meadows with small pools. Typical site of *Indolestes cyanea* (Selys) and its highest locality in the Langtang Valley (early May).

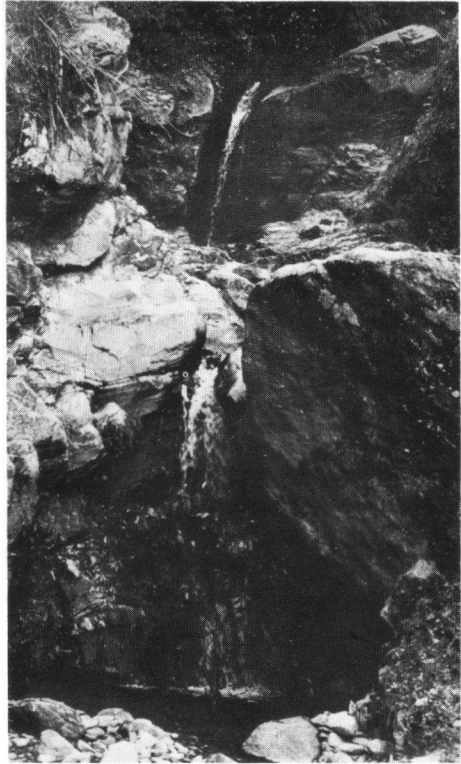
*ANISOPLEURA COMES* SELYS, 1880  
 Figures 5, 11

**Material.** — 1 ♂, Ramche-Dhunche, 1530 m, 10-5-1976. At a waterfall in a very rapid cascading stream (Fig. 11).

**Karyotype.** —  $2n \delta = 25$ ,  $n \delta = 13$ . There is but little size variation among the autosomes, save for a medium-sized *m*-pair, whose bivalent, at primary spermatocyte metaphase, is nearly equal in size to X (Fig. 5).

**Discussion.** — It is interesting to note that the karyotype of this species rather closely resembles that of *Bayeria indica* (Sel.) (cf. CHATTERJEE & KIAUTA, 1973; KIAUTA, 1975), whereas the complement of the primitive (sensu FRASER, 1957) *Epallage fatime* (Charp.) is distinct in a number of features, including the absence of an *m*-pair (cf. KIAUTA, 1970).

Fig. 11. Waterfall (1530 m) on the Ramche-Dhunche track above the Trisuli Khola, frequented by *Anisopleura comes* Selys and *Neallogaster* sp. aff. *hermionae* (Fraser).



*NEALLOGASTER* SP. AFF. *HERMIONAE* (FRASER, 1927)  
 Figures 6-7, 11-12

**Material.** — 1 ♂, Langtang Valley (a cascading stream, cf. Fig. 12), 2150 m, 24-4-1976; — 1 ♂, Syabru-Mangsen (a small, rapid stream), 2670 m, 6-5-1976; — 1 ♂ Grang (a stream, with numerous cascades and waterfalls), 1930 m, 10-5-1976.

**Karyotype.** —  $2n \delta = 25$ ,  $n \delta = 13$ . The elements are fairly uniform in size and shape. At primary spermatocyte metaphase a relatively large X is the smallest of the set. There are no *m*-chromosomes, and the size graduation of the

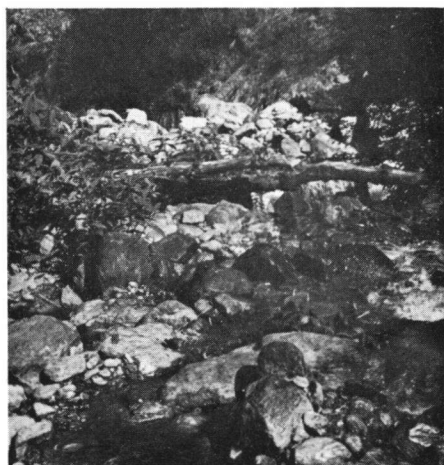


Fig. 12. A cascading tributary of the Langtang Khola (2150 m), between the villages of Syabru and Ghora Tabela, frequented by numerous *Neallogaster* sp. aff. *hermionae* (Fraser).

bivalents is so small that hardly two or three of them can be individually recognized in figures (cf. Figs. 6-7).

**Discussion.** — So far only six representatives of the genera *Anotogaster* (1) and *Cordulegaster* (5) have been studied cytologically (for references cf. KIAUTA, 1972), all pertaining to FRASER'S (1957) *Cordulegasterinae*, and nothing is known on the chromosome complements in the subfamilies *Chlorogomphinae* and *Aeshnidiinae*. While the karyotypes of most, if not all, hitherto studied species are characterized by the occurrence of an *m*-pair (bivalent), the latter is lacking in our *Neallogaster*.

*ORTHETRUM JAPONICUM INTERNUM* McLACHLAN, 1894

Figure 8

**Material.** — 1 ♂, marshy meadow under the village of Syabru, 2000 m, 5-5-1976.

**Karyotype.** —  $n \delta = 13$ , including a small X and a minute *m*-bivalent. The present material does not deviate from that from the surroundings of Kathmandu (cf. KIAUTA, 1975), nor does the karyotypic morphology seem to be significantly distinct from that encountered in various populations of the Japanese nominate subspecies (for references cf. KIAUTA, 1975).

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The specimens were identified by Dr. M.A. LIEFTINCK (Rhenen, The Netherlands).

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